

Technical Report #5

Goat and Piper Creeks Watershed Analysis

Overview

In May 1997, Plum Creek Timber Company, L.P., initiated a watershed analysis in the Goat Creek and Piper Creek basins, both of which are tributaries to the Swan River in northwestern Montana. Watershed analysis is a process to address the cumulative effects of forest practices on two areas of public resources: fish habitat and water quality. The potential and existing resource conditions are described in the report, as are the relevant physical processes that affect the resource condition. The purpose of this report is to present results of the resource assessment and provide documentation and justification for the identification and management of sensitive areas.

Key Points

Watershed analysis is conducted by studying separate **modules**. The modules studied in this Technical Report include the following:

- Mass wasting
- Surface erosion
- Hydrology
- Riparian function
- Channel condition
- Fish habitat

Once the analysts had worked through the modules, the information was brought together with the data from other modules to develop a more complete picture of the watersheds.

Supporting Technical Information

Plum Creek owns 22.1 percent of the analysis watersheds. The U.S. Forest Service manages 64.8 percent of the analysis area and the State of Montana manages 12.8 percent. Private lands comprise only 0.3 percent of the area. The dominant land use is forestry. In addition, both basins are used by the public for recreation such as hiking, hunting, fishing, and firewood cutting. This section summarizes the findings of the watershed analysis in each of the subject modules.

Mass Wasting. Piper and Goat Creek watersheds have steep slopes in a glaciated area. Although many avalanche chutes, rockfalls, and one large deep-seated landslide occurred naturally, only five small mass wasting sites were linked to forest management activities. These landslides resulted from steep cutslopes or concentration of road runoff onto steep slopes. Few landslides have delivered sediment directly to streams. Forest management on steep slopes requires caution to avoid landslide hazards.

Surface Erosion. Surface erosion from hillslopes and roads occurs when soil is exposed to surface water flow. Although there are local areas of soil disturbance on recently harvested hillslopes, field results show that Best Management Practices (BMPs) prevented sediment delivery to streams. The road erosion assessment compared road sediment delivery to natural background sediment. For the Goat Creek watershed, roads produce 39.3 tons of

sediment per year, or 11 percent above background. In the Piper Creek watershed, roads contribute 25.5 tons per year, or 24 percent above background. Therefore, road erosion is rated as a low hazard. Most of the sediment delivered to streams occurs at key points along roads. In the Goat Creek watershed, the worst five crossings deliver 70 percent of the total sediment delivered by roads in the basin. Sediment delivery may be reduced by addressing stream crossings.

Hydrology. This module evaluated how streamflows have been altered by timber harvest. Little historical streamflow information is available for these basins. However, hydrologic model simulations and stream measurements suggest that there are no significant effects from forest management. A 5-year monitoring program is proposed to address the uncertainty, especially in terms of the distribution and melt rates of spring snowpack.

Riparian Function. This module evaluated the condition of riparian areas based on their ability to supply large woody debris (LWD) to stream channels and provide shade to maintain stream temperatures. Most stream segments within the watersheds met or exceeded the Washington Forest Practices Board criteria for LWD and shade. If the Montana stream management zone guidance is used for harvest here, it would work in most instances but may need to be modified for areas where the stream channel migrates across a wide zone. Further research is needed to determine the actual effects of timber harvest on riparian function.

Channel Condition. The geologic history of the area was used to determine the stream channel types and their potential sensitivity to forest management. The

streams were classified into Geographic Mapping Units. These units form borders around areas of high value and lower value fish habitat and indicate the relative sensitivity of stream segments to forest management practices.

Fish Habitat. Goals of the fish habitat module are to document existing and historic fish distribution, assess current habitat conditions, identify important habitat, and identify impacts to habitat from land management. Trout and char species in the analysis area include brook, bull, cutthroat, and rainbow trout. Brook and rainbow trout are non-native species, which were stocked as early as 1926. Although natural barriers to fish passage are present, no man-made barriers to fish movement were found in the analysis area. Fish habitat conditions varied from fair to good in the analysis watersheds and were largely a function of channel type rather than forest management activities.

Conclusion and Implications

Stream channels are shaped by a number of variables that interact to create a unique stream segment. Some variables, such as the gradient, valley confinement, and drainage area of a stream, are relatively unchanged by human activities. Other variables, such as the amount of coarse and fine sediment, the amount of large wood in the stream channel, and the volume and timing of flood events, can be influenced by management activities. Gathering this information allows managers to develop management practices to minimize or prevent problems in sensitive areas.